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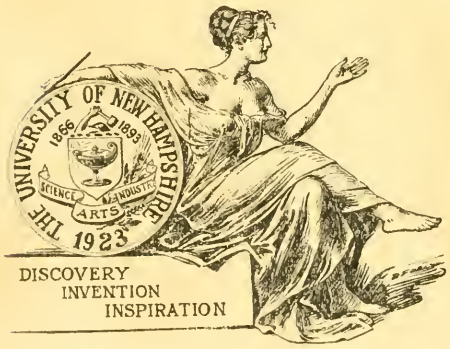

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NEW HAMPSHIRE
AGRICULTURAL EXPERIMENT STATION

COMMERCIAL APPLE INDUSTRY OF NEW HAMPSHIRE

FIGURE 1. Total trees in New Hampshire commercial orchards by counties

By G. F. POTTER and H. A. ROLLINS

THE UNIVERSITY OF NEW HAMPSHIRE
DURHAM, N. H.

Forecast of Development of New Hampshire Commercial Orchards

Variety		Date			
		1925	1930	1935	1940
Baldwin	Number trees over 10 years	132,571	145,120	148,560	151,599
	Production — Barrels	153,655	179,315	205,590	234,324
	Production — Per cent	100.0	116.7	133.8	152.5
McIntosh	Number trees over 10 years	27,132	46,783	58,110	69,251
	Production — Barrels	19,544	35,609	51,186	62,795
	Production — Per cent	100.0	182.2	261.9	321.3
Wealthy	Number trees over 10 years	9,082	14,678	15,970	16,631
	Production — Barrels	4,780	9,302	11,673	12,189
	Production — Per cent	100.0	194.6	244.2	255.0
Northern Spy	Number trees over 10 years	4,286	5,754	6,335	6,674
	Production — Barrels	2,379	3,078	3,833	4,270
	Production — Per cent	100.0	129.4	161.1	179.5
Delicious	Number trees over 10 years	657	3,616	7,899	11,735
	Production — Barrels	297	1,125	2,896	6,409
	Production — Per cent	100.0	378.7	975.1	2,158.0
Wagener	Number trees over 10 years	1,250	3,818	4,215	4,454
	Production — Barrels	963	2,206	2,745	3,798
	Production — Per cent	100.0	229.1	285.0	394.4
Gravenstein	Number trees over 10 years	4,199	6,266	7,569	8,785
	Production — Barrels	5,045	7,214	9,485	11,952
	Production — Per cent	100.0	143.0	188.0	236.9
All Others	Number trees over 10 years	28,993	33,490	34,624	35,408
	Production — Barrels	17,618	22,357	21,283	22,005
	Production — Per cent	100.0	126.9	120.8	124.9
Total	Number trees over 10 years	208,170	259,525	283,282	304,537
	Production — Barrels	204,281	260,206	308,691	357,742
	Production — Per cent	100.0	127.37	151.11	175.12

COMMERCIAL APPLE INDUSTRY IN NEW HAMPSHIRE

By G. F. POTTER and H. A. ROLLINS

During the summer of 1925 a survey of the trees in the commercial apple orchards of New Hampshire was made by the New Hampshire Agricultural Experiment Station. This work was done in cooperation with the New England Research Council, similar surveys being made in most of the other New England states, in order to make available information in regard to the fruit situation throughout New England. The present publication deals wholly with the apple industry of New Hampshire, but it is expected that at an early date at least the most important data for the whole New England section will be available.

The work should be of value as a guide as to whether or not orchards should be planted; if so, as to what varieties may be used, and as to what methods or practices may best be used in present orchards in order to meet the forthcoming economic situation. Accordingly, in order to make this publication of greatest value the writers have not hesitated to add information and opinions as to the commercial characteristics of certain varieties, the necessity or value of certain orchard practices and other material not strictly gained from the growers' replies.

Each farm on which there was known to be an orchard of at least 100 bearing trees or 200 non-bearing trees was visited by a member of the Experiment Station staff. Information as to the number of trees of each variety and their age, the production for the crop of 1924, the methods of grading, selling, and the prices obtained was asked. In all, 804 farms were visited, on which there were approximately 352,000 trees. In 65 cases either because of the absence of the owner, lack of records, or unwillingness of the proprietor to give the information, there was no record as to the crop harvested, or prices received. These 65 orchards contain approximately 31,000 trees and appear to be an average group including some of the large orchards and some of the smaller ones.

Information as to the farms which ought to be visited was obtained by inquiry in each community. It is believed that practically all orchards of the appropriate size were included and that the record is practically complete as regards commercial orcharding in this state.

The number of trees is approximately 40 per cent of the number reported for the state by the United States Census of 1924. Thus, while commercial orcharding has been gaining rapidly in recent years in this state and the farm orchards have been declining, at the present time less than one-half of the trees are in commercial orchards. It is significant that when these trees are grouped as bearing and non-bearing we find that the commercial orchard survey covers only 38 per

TABLE I.— *Total Apple Trees in the Commercial Orchards in the Several Counties of New Hampshire, 1925*

	BELKNAP	CARROLL	CHESHIRE	COOS	GRAFTON	HILLSBOROUGH	MERRIMACK	ROCKINGHAM	STRAFFORD	SULLIVAN	STATE TOTAL
Number of farms reporting	38	26	68	3	12	303	121	167	55	11	804
Non-bearing trees—Permanents	3,951	2,645	6,490	93	5,002	45,710	10,799	21,889	4,444	2,843	103,866
Fillers	164	470	——	——	75	4,285	350	7,368	543	——	13,255
Total non-bearing	4,115	3,115	6,490	93	5,077	49,995	11,149	29,257	4,987	2,843	117,121
Per cent of State total of non-bearing trees	3.5	2.7	5.5	0.1	4.3	42.7	9.5	25.0	4.3	2.4	100.0
Bearing trees—Permanents	8,552	6,626	13,601	382	3,968	86,545	33,896	45,313	20,435	2,363	221,681
Fillers	218	——	970	——	90	3,898	3,004	4,773	154	50	13,157
Total bearing trees	8,770	6,626	14,571	382	4,058	90,443	36,900	50,086	20,589	2,413	234,838
Per cent of State total of bearing trees	3.7	2.8	6.2	.2	1.7	38.5	15.7	21.3	8.8	1.1	100.0
Total permanent trees	12,503	9,271	20,091	475	8,970	132,255	44,695	67,202	24,879	5,206	325,547
Total filler trees	382	470	970	——	165	8,183	3,354	12,141	697	50	26,412
Grand total all trees	**12,885**	**9,741**	**21,061**	**475**	**9,135**	**140,438**	**48,049**	**79,343**	**25,576**	**5,256**	**351,959**
Per cent of grand total in each county	**3.70**	**2.80**	**6.00**	**.10**	**2.60**	**39.90**	**13.60**	**22.50**	**7.30**	**1.50**	**100.0**
Per cent in each county non-bearing	31.91	31.98	30.82	19.58	55.58	35.60	23.20	36.87	19.50	54.09	33.28
Per cent fillers in each county	2.96	4.82	4.61	.0	1.81	5.83	6.98	15.30	2.73	.95	7.50

cent of the bearing trees, but in the non-bearing trees nearly 50 per cent of the census total is included. This is indicative of the trend. The newer plantings are more largely in commercial orchards than those which were set in previous years. Moreover, the 38 per cent of bearing trees covered in the survey yield 46 per cent of the total apple crop of the state. Average production per tree as recorded in the census is only 1½ bushels; average production per bearing tree for those covered in the commercial survey is 1.9 bushels. This production is, of course, exceedingly low. However, in the commercial orchards as we shall see later, a great majority of the trees are in their first years of bearing, when although they are recorded as bearing trees the crop is necessarily very small.

Data on the total number of farms and total number of trees as permanent and filler, bearing and non-bearing are given in Table 1. The same data are shown diagramatically in Figure 1 and in the maps, Figures 2 and 3. In the main the orchard territory in New Hampshire extends throughout the five southern counties as far north and west as the district about Lake Sunapee and to the eastward somewhat farther north, to the vicinity of Lake Winnipesaukee. In Hillsborough County we have three centers of the industry, one in Hollis, one extending through the towns of Lyndeboro, Wilton, Temple and one in Hancock. In Rockingham County there is a rapidly developing district in the western portion of the county in the vicinity of Derry, Londonderry, and Chester. A second district, at present high in production but without as many young trees, is found in the eastern portion of the county in the vicinity of Stratham, Greenland, and Newington. In Hampton Falls there is one relatively large orchard which gives this town a high number both of bearing and non-bearing trees. Another extremely favorable territory for fruit production, particularly of the Baldwin apple, is found in Merrimack County in the towns of Hopkinton, Boscawen, Salisbury, and Canterbury.

Seventy-six per cent of the total commercial plantings of the state are found within the three counties mentioned. Orcharding continues through the ridges of Strafford County with relatively large plantings in the town of Rochester. In comparison to the total area in farms this section of the state contains nearly as many trees in commercial orchards as does Merrimack County. Cheshire County in the southwest corner has not as yet developed the industry to as great an extent as in the other sections mentioned.

The commercial plantings in New Hampshire, as we shall see later, contain a relatively large proportion of the Baldwin variety. In the past this has been true to an even greater extent than at present. While the Baldwin develops excellent color and texture in a cool climate, it is exceedingly subject to black heart and other forms of winter injury. The extension of the orchard industry beyond the limits outlined has, therefore, probably been restricted largely by climatic factors. Individual orchards in the territory to the north and

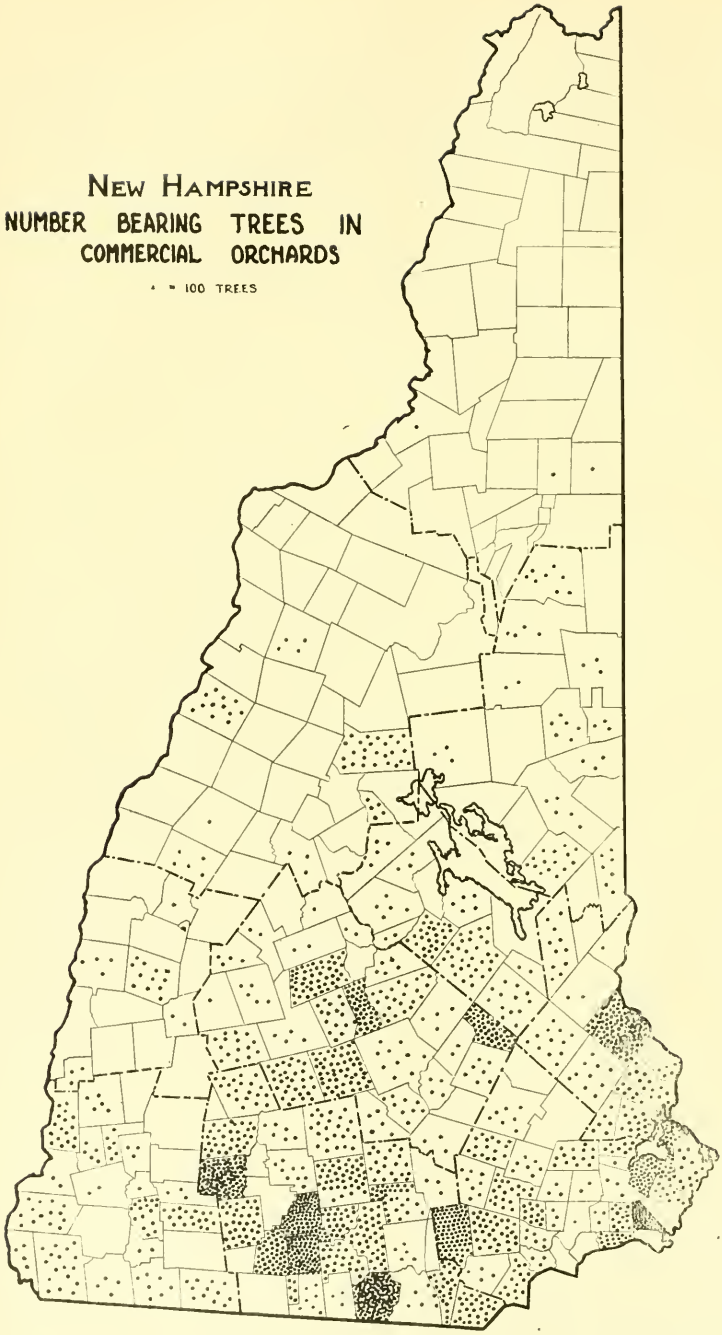

FIGURE 2. Distribution of bearing trees in New Hampshire commercial orchards. 1 dot equals 100 trees.

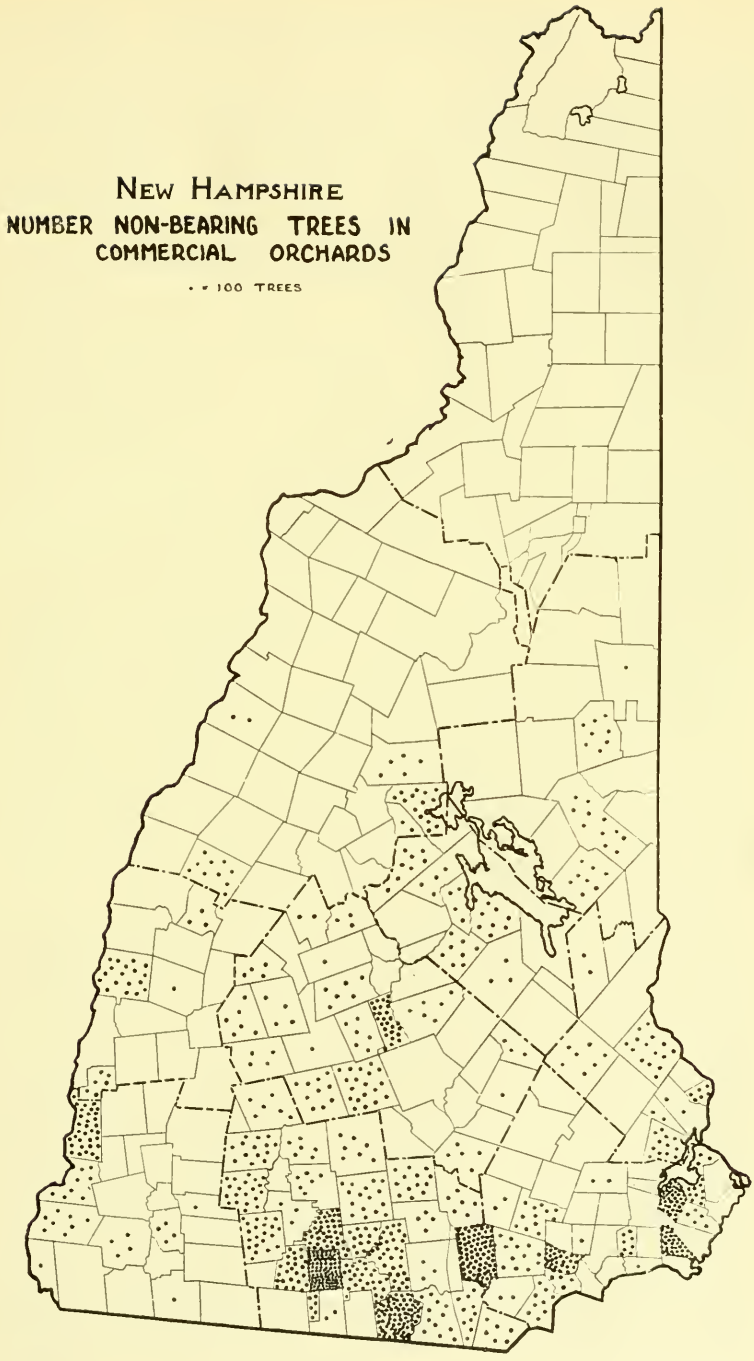

FIGURE 3. Distribution of non-bearing trees in New Hampshire commercial orchards. 1 dot equals 100 trees.

west of the commercial areas are successful. There is one large plantation in the town of Campton in which the trees are doing well because they are planted on an especially advantageous site. There are undoubtedly other similar favorable situations where the Baldwin and other tender varieties could be grown. In Carroll County Baldwins were formerly produced to a much greater extent than at present, and commercial plantings of this variety are found equally far north in adjoining sections of the state of Maine.

However, everything considered, it is probably good judgment on the whole not to plant the more tender varieties of apples in Sullivan, Grafton and Carroll counties. The extension of the orchard industry using hardier sorts such as McIntosh, Spy and Delicious would be entirely practical provided that market demands warranted their planting. There is also a possibility that in this territory, which is a vast summer resort, early varieties of apples might be produced for the tourist and summer trade. In southern New Hampshire, which more properly constitutes New Hampshire's apple belt, there is ample room for expansion of the industry in fields suitable for fruit production which have not yet been planted.

Some indication as to the trend of the industry may be gathered from a consideration of the proportion of non-bearing trees in each county. Strangely enough, the highest proportion of non-bearing trees is found in Grafton and Sullivan counties, two of the group in which orcharding is thought to be relatively unimportant. The explanation undoubtedly lies in the fact that, with a small number of trees in the county, one or two large new plantations form a relatively large part of the total. This is also true in Cheshire County, where of the total 6,490 non-bearing trees nearly one-half are known to be in one orchard in Walpole. But for the fact that this and another commercial orchard have recently been planted, Cheshire County would show a relatively low proportion of non-bearing trees.

Among the three most important fruit-producing counties Merrimack shows the lowest proportion of non-bearing trees. Some large orchards were planted in Merrimack County fifteen or twenty years ago, increasing relatively the number of bearing trees. Within recent years there has not been as much planting in that territory as in the orchard centers of Hillsborough and Rockingham County.

Relative proportions of non-bearing trees in this commercial survey and in the 1924 census are of interest. The average for the state in the commercial survey is 33.3 per cent non-bearing. In the census, 28 per cent are reported as non-bearing, indicating that a larger proportion of the trees in small farm orchards are old trees. In 1910 the census showed only 17 per cent of non-bearing trees for the whole state. At that time there were many trees in farm orchards and much less than at present in commercial plantings. During the period just preceding 1920, active planting was begun in some of the more important orchard districts. As a result, the 1919 census shows 24 per cent of non-bearing

trees for the whole state. A commercial survey at that time would undoubtedly have shown a very much higher proportion of non-bearing trees than the present one. The 1925 census shows slightly more non-bearing trees for the state total than did the census of 1920 .

In making the survey, the trees were classified according to age. These data for each county and for the state as a whole are shown in Table 2. It is encouraging to note that over 40 per cent of all the trees in New Hampshire are under 10 years of age and nearly 60 per cent are under 15 years. On the other hand, the commercial orchards contain relatively few trees between the ages of 15 and 30, only about 16 per cent of the total being in this class. About 26 per cent of all trees in commercial orchards are more than 30 years of age. This gives evidence of a comparatively recent development of commercial orcharding, the old trees probably for the most part being trees which have been renovated by the same growers who have planted the newer orchards. It is not surprising that average production per bearing tree is low because such a small proportion of the trees are at their most productive age, namely between 20 and 30 years. Even without further plantings it is evident that for many years there will be a large annual increase in commercial apple crops due to increased bearing surface on the trees which are now under 15 years of age.

Planting in New Hampshire reached its height during the years of 1915 to 1920. However, planting during the last five years has been at a rate only slightly lower than that of the period from 1915 to 1920. In the leading fruit county, Hillsborough, the plantings of the last five years have exceeded those of the previous five by an average of more than 1,000 trees per year. Casual observation indicates that this rate of planting is being maintained or even increased at the present time. At a meeting of fruit growers held in Wilton during February, 1926, the fact was disclosed that the men present had purchased about 15,000 trees for planting in 1926, this number alone being about half that planted in the whole county during the period of 1920-25.

The very decided stimulus to apple planting which began in 1910 was a general one in all areas of the state excepting Coos County. Of those counties situated within the more favorable fruit areas, Merrimack appears to have shown the least increase during this 15-year period. This, however, is apparently due not to the fact that orchard planting has been neglected in Merrimack County but rather to the fact that planting commenced in that county ten or more years earlier than in the others. Thus we find that 38 per cent of the trees in Merrimack County are between 15 and 30 years of age, a much larger proportion of trees of this age than is found in any other county.

Nearly 93 per cent of all the trees in Grafton County are under 15 years of age. This is a much higher proportion than in any other county and is due to the presence of one or two large commercial orchards in a section where there are otherwise very few trees.

Sullivan, Carroll, Cheshire, Rockingham and Hillsborough counties

TABLE II.—*Ages of Trees in New Hampshire Commercial Orchards, 1925*

	UNDER 5 YEARS	5 TO 9 YEARS	10 TO 14 YEARS	15 TO 19 YEARS	20 TO 29 YEARS	30 YEARS OR OVER
New Hampshire, total						
Number of trees	66,963	76,826	58,683	26,443	30,430	92,614
Per cent of total	19.0	21.8	16.7	7.5	8.7	26.3
Cumulative per cent of State total	19.0	40.8	57.5	65.0	73.7	100.0
Per cent of fillers	12.0	15.1	10.6	2.0	——	——
Belknap County						
Number of trees	2,690	2,008	1,205	372	4,333	2,277
Per cent of County total	20.9	15.6	9.3	2.9	33.6	17.7
Per cent fillers	5.8	5.4	8.3	3.2	——	——
Carroll County						
Number of trees	2,993	1,092	2,010	1,309	730	1,607
Per cent of County total	30.7	11.2	20.6	13.5	7.5	16.5
Per cent fillers	15.7	——	——	——	——	——
Cheshire County						
Number of trees	2,614	6,217	3,854	1,104	873	6,399
Per cent of County total	12.4	29.6	18.3	5.2	4.1	30.4
Per cent fillers	——	3.2	19.5	13.6	——	——
Coos County						
Number of trees	90	7	50	185	122	21
Per cent of County total	18.9	1.5	10.5	38.9	25.7	4.5
Per cent fillers	——	——	——	——	——	——
Grafton County						
Number of trees	2,173	3,382	2,919	125	10	526
Per cent of County total	23.8	37.0	31.9	1.4	0.1	5.8
Per cent fillers	——	2.2	3.1	——	——	——
Hillsboro County						
Number of trees	30,508	26,101	25,049	11,510	8,680	38,590
Per cent of County total	21.7	18.6	17.8	8.2	6.2	27.5
Per cent fillers	10.3	7.8	11.9	——	——	——
Merrimack County						
Number of trees	5,894	8,191	7,865	8,270	5,293	12,536
Per cent of County total	12.3	17.0	16.4	17.2	11.0	26.1
Per cent fillers	5.9	12.2	19.7	5.2	——	——
Rockingham County						
Number of trees	15,978	25,167	6,500	2,373	6,094	23,231
Per cent of County total	20.1	31.7	8.2	3.0	7.7	29.3
Per cent fillers	22.0	31.1	11.3	1.4	——	——
Strafford County						
Number of trees	3,545	1,735	9,152	794	3,329	7,021
Per cent of County total	13.9	6.8	35.7	3.2	13.0	27.4
Per cent fillers	12.0	15.7	——	——	——	——
Sullivan County						
Number of trees	478	2,926	79	401	966	406
Per cent of County total	9.1	55.7	1.5	7.6	18.4	7.7
Per cent fillers	——	1.7	——	——	——	——

are all above average for the state in per cent. of trees under 15 years. Belknap County shows a relatively large proportion of trees between 20 and 30 years of age, there being more than 4,000 trees in this group, which is nearly 34 per cent of the county total. In conclusion it may be said that the trend in orcharding in general is one of rather rapid expansion, although at not quite so rapid a rate as that at which expansion took place during the years of 1915-1920.

VARIETIES

New Hampshire is predominately a winter apple state. The New Hampshire farmer has felt that those varieties are safest which have a reasonably long harvest season, which are harvested in cool weather and which need not be marketed hastily. Some 67 per cent of all trees in the state are classified in the list of winter sorts. The leading fruit counties of Hillsborough and Rockingham have respectively 68 and 69 per cent of winter varieties, almost exactly the same as the average for the state. In Merrimack County, however, more than three-fourths of the apples are of winter sorts.

The leading variety is Baldwin with nearly 185,000 trees, making up more than 50 per cent of the grand total of all trees and three-fourths of the 1924 crop. The New Hampshire farmer has learned through long years of experience that he can depend upon the Baldwin for good returns. It is a variety relatively resistant to ordinary diseases, easy to handle, and one for which, although it is not of extremely high dessert quality, the market has for many years shown a decided preference. It is particularly well adapted to a locality where the summers are cool and develops its best texture, color and quality in a light soil such as that in which most New Hampshire orchards are planted. Therefore, its popularity appears to be justified even although it has two serious faults, its tenderness to winter injury and its susceptibility to Baldwin spot. The four leading fruit counties have each planted more of the Baldwin variety than the average for the state. As may be expected, the proportion of Baldwin trees is lower in the northern counties, there being only 5 per cent of this variety in Coos, 15 per cent in Grafton and approximately 30 or 40 per cent in Sullivan and Belknap. In Carroll County 45 per cent of the trees are Baldwin, a relatively high proportion considering the geographical situation of the county.

While discussion of the practice of using fillers will be taken up later, it is of interest in connection with our observations of the different varieties to note the proportion of each planted for that purpose. The reader will, of course, understand that a filler tree is one planted to occupy temporarily the space between the trees of the permanent orchard. Not a single Baldwin tree has been planted as a filler. This is indicative of the faith which the New Hampshire fruit growers have in this variety. The removal of other varieties which are planted between the Baldwins will tend to raise the proportion of this variety to the total trees during the next 15 years.

It is of interest also to note that 24 per cent of the Baldwin trees are non-bearing, and that 28 per cent are under 10 years of age. Apparently this variety commonly begins to bear fruit after being planted 10 years. On the basis that it requires 10 years for a tree to come into bearing and that bearing continues until 50 years of age, it would require 20 per cent of non-bearing trees to maintain the orchards. The percentage of non-bearing trees is slightly higher than this, and it is probable also that with care the period of useful bearing need not be over until well beyond the age of 50 years. An orchard of Baldwins 50 years old which the writer recently visited in the town of Temple appears to be only in its prime. Hardly a tree is missing and the crops of fruit are the largest ever harvested. That the faith in the Baldwin variety is of long standing is indicated by the fact that approximately 76,000 of the Baldwin trees, or 41 per cent of the total, are more than 30 years of age. There was a period evidently between 1895 and 1905 when the planting of Baldwins was not so large in proportion to the previous plantings of trees as at the present time. However, the planting of this variety appears to have gained, beginning as early as 1905, and it is the first variety to show the recent stimulus of planting, previously mentioned. Crops of Baldwin may be expected to increase, although other varieties will probably increase more rapidly, and it is not likely that Baldwins will long continue to constitute as large a proportion of the crop as in 1924.

No other variety approaches Baldwin in the number of trees planted. Among winter varieties there are nearly 20 times as many Baldwin trees as of any other single sort. It is somewhat surprising to note that the winter variety of second importance is the newer sort Delicious, of which there are approximately 11,000 trees, comprising 3 per cent of the total. It ranks fourth in number of trees planted, when all varieties are considered irrespective of season.

The planting of Delicious has, of course, been stimulated by advertising and publicity. However, the fruit grower who judiciously considers the facts will note some outstanding advantages of this variety as compared to Baldwin. It is much more hardy and not subject to spot. True, it is susceptible to apple scab, but this may easily be controlled by thorough spraying. The Delicious is also generally held to be a variety of higher dessert quality than the Baldwin. The only question as to the desirability of planting this sort is as to the market demands for the type of Delicious which is grown here. It is well colored, but generally of small size. If forced for size it sometimes watercores. Some believe its quality to be better than when grown in other sections, but there is much question as to whether the majority of buyers are of this opinion. Ninety-one per cent of the trees are non-bearing, 94 per cent are under 10 years of age, and the crop to date is negligible. The future of Delicious as a variety for New Hampshire is, therefore, still to be determined. Twelve per cent of the trees of this variety have been planted as fillers. It is possible to plant two varieties in the

TABLE III.— *Trees and Production in New Hampshire Commercial Orchards by Varieties, 1925*

VARIETY	TREES ON BASIS OF 804 FARMS								PRODUCTION IN BARRELS—740 FARMS	
	NON-BEARING		BEARING		TOTAL TREES					
	Number	Per Cent Fillers	Number	Per Cent Fillers	Number	Per Cent Fillers	Per Cent Non-bearing	Per Cent of Grand Total Formed by Each Variety	Barrels	Per Cent of Total
Transparent	227	—	736	—	963	—	23.57	0.3	295	0.1
Astrachan	583	3.95	989	0.51	1,572	1.78	37.09	0.1	785	0.4
Williams	575	—	514	—	1,089	—	52.80	0.3	468	0.2
Duchess	1,432	5.24	1,982	2.62	3,114	3.90	11.94	1.00	562	0.3
Others	118	—	925	—	1,043	.58	11.31	0.3	598	0.3
Total Summer varieties	2,935	3.34	5,146	1.34	8,081	2.07	36.32	2.3	2,708	1.3
Per cent total Summer varieties	36.32	—	63.68	—	—	—	—	—	—	—
Gravenstein	4,544	11.73	4,637	7.91	9,181	9.80	49.49	2.6	5,045	2.5
Wealthy	9,490	53.67	12,167	30.41	21,657	40.61	43.82	6.2	4,780	2.3
McIntosh	32,130	9.90	38,424	13.41	70,554	11.81	45.54	20.0	19,544	9.6
Wolf River	159	—	691	5.07	850	4.12	18.71	0.2	432	0.2
Others	1,166	—	3,302	2.94	4,468	2.17	26.10	1.3	1,812	0.9
Total Fall varieties	47,489	18.55	59,221	15.79	106,710	17.02	44.50	30.3	31,613	15.5
Per cent total Fall varieties	44.50	—	55.50	—	—	—	—	—	—	—
Total of Fall varieties except McIntosh	15,359	36.64	20,797	20.19	—	—	—	—	—	—
Baldwin	44,464	—	140,341	—	184,805	—	24.06	52.5	153,655	75.2
Northern Spy	3,373	15.62	4,355	4.04	7,728	9.10	43.65	2.2	2,379	1.2
Delicious	9,793	12.25	966	4.55	10,759	11.56	91.02	3.0	297	0.1
Greening	400	—	2,698	—	3,098	—	12.91	0.9	1,926	0.9
Russett	6	—	1,034	0.58	1,040	.58	.58	0.3	1,067	0.5
Ben Davis	376	—	1,514	—	1,890	—	19.89	0.5	1,163	0.6
Sutton Beauty	—	—	1,025	—	1,025	—	.00	0.3	22	—
Winter Banana	1,046	7.17	966	62.11	2,012	33.55	51.99	0.6	830	0.4
Wagener	3,018	74.95	3,825	67.42	6,843	70.74	44.10	1.9	963	0.5
Others	4,221	6.75	13,747	2.42	17,968	3.43	23.49	5.1	7,652	3.8
Total Winter varieties	66,697	6.52	170,471	2.19	237,168	3.41	28.12	67.4	169,960	83.2
Per cent toal Winter varieties	28.12	—	71.88	—	—	—	—	—	—	—
All varieties total	117,121	11.32	234,838	5.60	351,959	7.50	33.28	—	204,281	100.0
Per cent of grand total	33.28	—	66.72	—	—	—	—	—	—	—

so-called quincunx system in such a manner that it makes no difference which is removed. In other words, judgment as to which variety is permanent and which is filler may be deferred until after 20 to 25 years of test. Plantings of Delicious set in this manner would undoubtedly in the present survey be recorded as fillers, although at the end of 20 years they might prove to be the permanents. It appears to be good judgment to use this plan in planting the variety.

One might expect that the Delicious would be used as a winter variety in the sections which are relatively cold and therefore not well adapted for planting of the Baldwin. However, we find that Coos County has planted very few. It is most largely found in Rockingham, Sullivan, and Cheshire counties, with Belknap, Merrimack and Grafton showing the lowest average plantings.

Northern Spy ranks third in commercial importance among winter sorts and sixth among all varieties, there being approximately three-fourths as many trees as of Delicious. Forty-three per cent of the trees are non-bearing, and 44 per cent are under 10 years of age. Apparently during the period from 1905-1910 very few trees of this variety were set. But with the revival of fruit growing in 1915, plantings of Spy increased along with those of other varieties. That the Northern Spy, which is so long and favorably known for its high dessert quality, does not constitute a larger proportion of New Hampshire apples is apparently due to the fact that the growers in the principal commercial sections in the southern part of the state have been afraid that they could not produce a high quality apple of this variety. It is capricious in its requirements as to soil and climate, and under unfavorable conditions the fruit is green and of poor flavor. As a consequence, in Hillsborough County we find less than 1 per cent of trees of this variety.

Another factor that restricts the planting of the Spy is its slowness in coming into bearing. While the proportion of trees under 10 years of age and the proportion of non-bearing would indicate that in this respect it is but slightly later than the Baldwin or Delicious, it is known that the first crops of apples are largely borne terminally on twigs; and while the trees may be classified as bearing, the crops are relatively small. It is somewhat surprising in view of this fact to find that approximately 9 per cent of the Northern Spy trees are classified as fillers. An explanation of this fact may lie in the changing opinion in regard to the value of McIntosh. As has been previously stated, orchards may be so planted that the decision as to which variety may be the fillers and which may be the permanents may be delayed until the trees are 20 to 25 years of age. It does not appear likely that any person would have deliberately set Northern Spy as a filler. It is quite possible that it may have been interplanted with McIntosh, and even at this date the grower has come to the conclusion that the Spy rather than the McIntosh will be removed when they begin to crowd.

The best Northern Spies in New Hampshire are reputed to be grown among the hills of Belknap County in the territory of Lake Winnepe-

saukee. The survey shows this is the stronghold of the variety for the state, 8 per cent of the trees of Belknap County being Spy and 4 per cent of those in Carroll County. Likewise in Grafton, Coos, and Cheshire County there are 5 per cent of trees of this variety. In resistance to cold the Northern Spy is much superior to Baldwin and probably is approximately on a par with the Delicious. The residents of the northern counties of New Hampshire use good judgment in planting it.

Wagener ranks fourth in commercial plantings among the winter varieties, and seventh when fall sorts are also considered. However, most of the trees of this variety have been planted as fillers, nearly 70 per cent of the bearing trees and three-fourths of the non-bearing trees being so classified. There are large differences of opinion among New Hampshire fruit growers as to the desirability of the Wagener variety. On the whole, those who are serving the local market, selling either directly to the consumer or to the retail store, find that Wagener is an excellent variety to sell after the McIntosh season. It keeps well and has a better dessert quality than Baldwin. On the other hand, on account of irregular shape and poor color this variety does not meet with ready sale on the wholesale market and returns for several seasons have been lower than on the other winter sorts. It has been admirably adapted to use as a filler because of its habit of bearing at a very early age. The commercial fruit grower has been inclined to look favorably upon it because it is about the only variety of filler which is a winter apple. Its planting for the wholesale market at the present time is scarcely to be encouraged. The commercial crop is now very small, but may be expected to increase materially because more than 80 per cent of the trees are still under 10 years of age. Early bearing is indicated because only about 44 per cent are non-bearing. In view of the indifferent success with which it is marketed today, it does not appear good policy to plant it to any large extent. The variety is found about equally distributed in the different sections except that it constitutes 6 per cent of the trees of Carroll County.

On the average 30 per cent of New Hampshire apple trees are of fall varieties, mostly McIntosh, Wealthy and Gravenstein. The trees are young and as yet produce only about 15 per cent of the crop. The proportion of fall sorts is relatively constant in the different counties, Merrimack being lowest with 20 per cent, and Grafton highest with 51 per cent. One might expect more of the relatively hardy fall varieties to be planted in the northern counties, but in general this is not the case.

Among fall varieties McIntosh is the outstanding leader, constituting about 20 per cent of the total trees of the state and ranking in commercial importance next to Baldwin. In most of the counties the proportion of McIntosh trees is almost identical with the average for the state. Grafton County is highest with 37 per cent, most of these in a very few plantations. Coos County is lowest with 6 per cent. In this territory, where the variety would be of greatest value, the farmers are not well informed as to its hardiness and other merits or else fear scab, because

they are not well equipped to spray. Merrimack County has only 12 per cent, the reduced proportion being undoubtedly due to the very strong preference for Baldwin in that territory.

While there are less than half as many McIntosh trees as of Baldwin and the crop harvested in 1924 was less than 10 per cent of the total, a glance at Fig. 4 indicates that in recent years the McIntosh has been gaining rapidly. There are more than seven-eighths as many McIntosh trees under 15 years of age as there are Baldwins. There are more than 14 times as many Baldwins as McIntosh over 15 years of age. During the period between 1920 and 1925, only 10 per cent more Baldwins than McIntosh were planted.

The popularity of the McIntosh is due to many factors. It is relatively hardy and bears large regular crops at an early age. Only 45 per cent of the trees are recorded as non-bearing, although 61 per cent are under 10 years of age. Its fine dessert quality has created an active and growing demand in the market. While production of McIntosh has increased with great rapidity in recent years, its popularity with the buying public has made demand keep pace with supply.

New Hampshire growers have been conservative, and many have felt that production of even this fall variety with a limited storage period might be overdone. Some at first did not pick and handle it with sufficient care. However, within the past five years methods of picking, packing and handling the McIntosh have so improved that at the present time with prompt storage it is kept on the markets until March or even April. Now an increasing competition between the McIntosh and Baldwin is being felt. The buying public prefers the McIntosh as long as they can get it with the result that the stocks of Baldwins cannot be placed on the market as early in the season as was formerly the case.

Fear of the scab disease undoubtedly restricted planting of McIntosh at certain times. For a period prior to 1920 when the infection had gained a foothold in the orchards, some growers were nearly discouraged and even thought of grafting the trees to other sorts. With the development of better spraying methods the disease has been fully controlled and is no longer feared by the up-to-date grower.

The gradual appreciation of these facts has resulted in a growing confidence in this variety. An interesting side-light on the changing opinion as regards McIntosh may be gained from the proportion planted as fillers in recent as compared to former years. Ordinarily, because the fillers are removed at from 15 to 25 years of age, the bearing trees of any variety consist more largely of permanents than do the non-bearing. Thus with Wealthy, for instance, about 30 per cent of the bearing and 50 per cent of the non-bearing trees are fillers. With McIntosh 13 per cent of the bearing and slightly less than 10 per cent of the non-bearing trees are fillers. This simply indicates that growers who formerly planted the McIntosh for a filler are now setting it for a permanent tree. In the total of all fall varieties there is about 16 per

cent of fillers among the bearing trees and between 18 and 19 per cent in the non-bearing. However, if the McIntosh are omitted from this calculation we find that the other fall varieties show 20 per cent of fillers in the bearing group and nearly 37 per cent in the non-bearing.

From present indications expansion of the McIntosh industry would seem fully justifiable. The present plantings will no doubt provide more fruit than the New England markets will absorb. However, the McIntosh is not grown successfully farther south, and there are indications that a wide market can be developed by shipping to the South and West. We expect future plantings of McIntosh to exceed those of

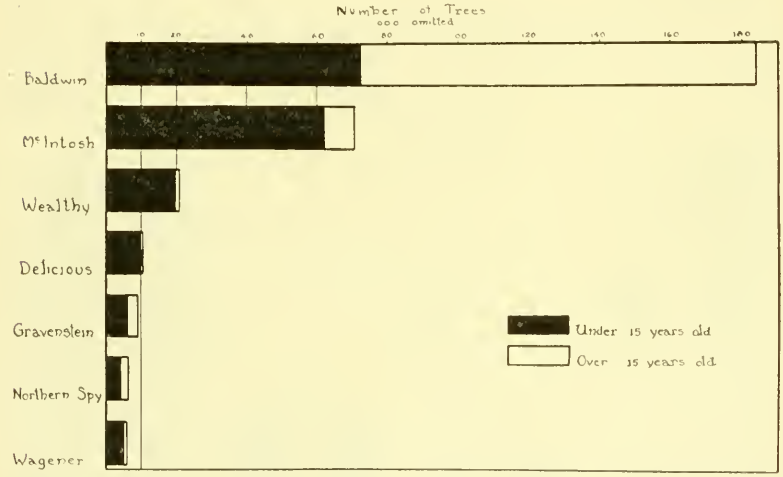

FIGURE 4. Number of trees of each of the important commercial varieties and proportion under 15 years of age.

Baldwin. Nevertheless, the planting of orchards exclusively of this variety would be poor policy because it must be harvested during a very short season and there is a definite limit to the number of trees which any given grower can handle successfully. It is wise to "break in" the picking crew on some other variety which requires less skill in harvesting. It would be unwise to attempt to organize a crew of pickers and packers exclusively for the short period of McIntosh harvest.

Wealthy, second in importance among fall varieties, ranks third among all varieties in commercial importance. Hardy, productive at an early age, cosmopolitan as to soil and climate, it has been produced with profit by a large number of growers. The rapidly growing popularity of the McIntosh, however, has meant increased competition which the Wealthy is unable to meet. The trade is definitely "off Wealthy" when the first McIntosh are available. To store these apples would be futile because it would only bring them into the midst of the McIntosh

season. Therefore, the whole crop must be thrown on to the market during a very short period. These facts, together with the information that many early apples have been planted south of New England has made many growers uneasy as to their plantings of Wealthy. Like the McIntosh, nearly all of the Wealthy have been planted during the last 15 years. It is probably well that over 40 per cent of this variety is planted as fillers and they may be expected to be removed from the orchard before many years. Extensive planting of the variety is not to be encouraged. It will probably be of greatest value to growers who sell locally, who know their demand and need not depend on the wholesale market.

Table IV.— *Age of the Leading Commercial Varieties*

	Under 5 Years	5 to 9 Years	10 to 14 Years	15 to 19 Years	20 to 29 Years	30 Years or Over
Baldwin						
Number	22,757	29,477	19,807	16,144	20,612	76,008
Per cent of total	12.31	15.95	10.72	8.74	11.15	41.13
Northern Spy						
Number	1,570	1,872	1,351	250	1,247	1,438
Per cent of total	20.32	24.22	17.48	3.23	16.14	18.61
Delicious						
Number	6,789	3,313	397	94	158	8
Per cent of total	63.10	30.79	3.69	.87	1.47	.08
Wagener						
Number	2,682	2,911	918	246	78	8
Per cent of total	39.19	42.54	13.42	3.59	1.14	.12
Gravenstein						
Number	2,449	2,533	1,196	1,002	670	1,331
Per cent of total	26.67	27.59	13.03	10.91	7.30	14.50
Wealthy						
Number	5,896	6,679	7,720	463	689	210
Per cent of total	27.22	30.84	35.65	2.14	3.18	.97
McIntosh						
Number	20,340	23,082	18,972	3,982	3,231	947
Per cent of total	28.83	32.72	26.89	5.64	4.58	1.34

Gravenstein ranks third among fall varieties. Among all varieties it ranks fifth, there being a slightly smaller number of trees than of Delicious and somewhat more than of Northern Spy. The Gravenstein is in many respects the best summer variety for the New Hampshire grower to plant. It finds a relatively ready market, although like the Wealthy it must be largely sold before the McIntosh season begins. Its planting would probably be more general but for the fact that like the Northern Spy it is particular in its requirements as to soil and climate. A somewhat larger proportion of the Gravenstein trees are over 15 years of age than is the case with any other commercial variety excepting Baldwin and Spy. About 50 per cent of the Gravensteins are ranked as non-bearing. As a variety to precede McIntosh and hence to lengthen the picking season, Gravenstein is probably one of

the best available, certainly so in those localities where the winters are not severe and it is known to be well adapted.

Summer apples are of relatively little importance in New Hampshire, constituting as a total only a little over 2 per cent of the trees of the state, and 1.3 per cent of the crop. Nearly half of the summer apples are of the Duchess variety, although apparently, at least in 1924, the Astrachans produced a greater yield. Duchess is found most abundantly in Coos and Strafford Counties. Its extreme hardiness commends it for planting in the northern sections. Its short season renders it practically out of the question for extensive planting for the wholesale market.

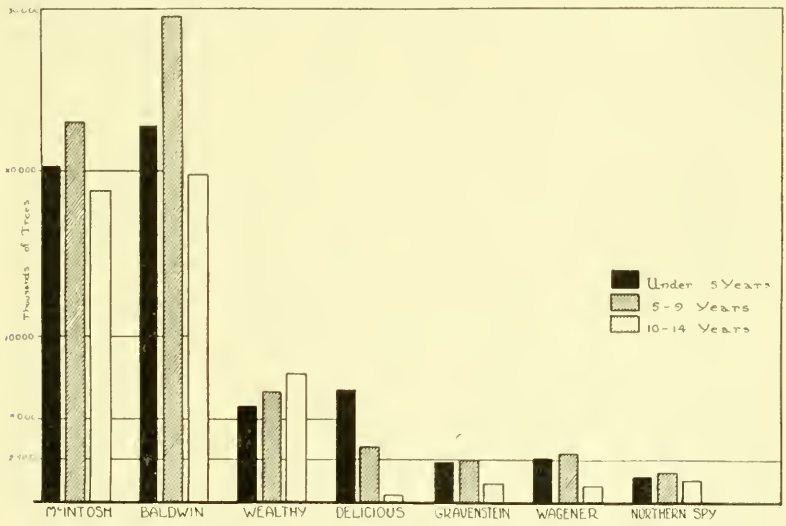

FIGURE 5. Plantings of the important commercial varieties by 5-year groups, 1910-1925.

The eight varieties which have been mentioned constitute 89.5 per cent of all the trees in New Hampshire commercial orchards. Nine other varieties, namely: Rhode Island Greening, Winter Banana, Sutton Beauty, Astrachan, Transparent, Williams, Roxbury Russet, and Ben Davis, add a total of 3.8 per cent. Two varieties are conspicuous for the lack of young trees, namely Sutton Beauty and Roxbury. Planting of the Rhode Island Greening and Ben Davis still continue on a small scale. Neither are well adapted to New Hampshire. The Rhode Island does not sell well except on local markets, and the Ben Davis is exceedingly small and of even worse than usual quality when grown here.

The balance of 6.7 per cent consist of miscellaneous sorts. This is relatively a small number of odd varieties, indicating a careful choice and a considerable agreement among New Hampshire growers as to the varieties best adapted to their condition.

USE OF FILLERS

From Table 1 we learn that a little over 26,000 trees, or 7.5 per cent of the total, are classified as fillers. There are several methods of planting fillers, and under some plans they will remain in the orchard much longer than under others. Probably in the majority of cases the fillers are trees which will be removed at from between 20 and 30 years of age.

The practice of using fillers is followed for the most part in the counties in which commercial orcharding has developed to the greatest extent. Thus, in Hillsboro and Merrimack counties the proportion is almost exactly the same as that for the whole state. In Rockingham County, 15 per cent of the trees are fillers, this figure undoubtedly being influenced to a considerable extent by one or two large orchards in which the trees have been planted at relatively close distances. Carroll and Cheshire County each have nearly five per cent of fillers, but in the others the proportion drops off rapidly.

The varieties of trees used for fillers are shown in Table 5 and the age of filler trees as a group is shown in Table 6. Early bearing is one of the requisites of a filler. In the group of filler trees between 5 and 9 years of age, 55 per cent are bearing. In permanent trees of the same age group only 32 per cent have reached bearing. Evidently the fillers have been correctly chosen for early production.

The proportion of each important variety planted for filler purposes has been noted in the previous discussion. The bulk of the filler trees, or practically 69 per cent of the total, are chosen from fall varieties. Wealthy furnishes slightly more than 33 per cent. McIntosh ranks next to Wealthy in total number of filler trees. A much smaller proportion of the total plantings of McIntosh are in filler positions; but because the whole number planted is so much greater, there are 8,334 McIntosh fillers as compared to 8794 Wealthy. While a high proportion of the Wageners are fillers, the total plantings of this variety are relatively small so that there are only 4,841 Wagener fillers. The remainder is scattered among several fall and winter varieties of lesser importance.

Whether or not the use of fillers is a good practice is a question upon which not all fruit growers are agreed. Some believe that they can get a larger return by planting early bearing apples in their orchards than by using any other kind of intercrop. Others believe that the expense of growing these trees is not justified for the short period during which they can produce before they crowd the permanent tree. While this can only be estimated approximately, it is certain that the "overhead" cost of producing apples is much higher with filler than with permanent trees.

Practically all of the fillers are young trees, about 98 per cent of them being under 15 years of age. The practice of planting fillers evidently began with the growth of the orchard industry dating about 1910. Not many will be removed during the next ten years, the period when

most will be cut down being from 1935 to 1950. The proportion of filler trees is not high in New Hampshire orchards, and it appears probable that not as many will be set as in the past. Many good growers declare that hereafter they will not set more than 54 trees per acre including 27 fillers.

In Table 7 there is given a classification of 801 of the New Hampshire commercial orchards on the basis of number of bearing trees. This is of interest because, on the whole, large units tend to be better cared for than small ones. Pending further information the Experiment Station has established the recommendation that a commercial orchard should contain as a minimum 500 trees, with additional plantings to replace fillers removed or other losses. There are at present in New Hampshire about 80 orchards which contain at least 500 bearing trees. The total number of trees in these orchards is about 46 per cent of all bearing trees in the commercial orchards of the state. It appears safe to assume that on account of better care these trees produce more than half of the commercial crop. These same orchards contain a little over

TABLE V.— *Varieties of Fillers in New Hampshire Commercial Orchards*

VARIETY	NON-BEARING		BEARING		TOTAL TREES	
	Number	Per Cent of Total	Number	Per Cent of Total	Number	Per Cent of Total
Astrachan	23	.2	5	——	28	.1
Duchess	75	.6	58	.4	133	.5
Others	——	——	6	.1	6	——
Total Summer varieties	98	.7	69	.5	167	.6
Gravenstein	533	4.0	367	2.8	900	3.4
Wealthy	5,094	38.4	3,700	28.1	8,794	33.3
McIntosh	3,181	24.0	5,153	39.2	8,334	31.6
Wolf River	——	——	35	.3	35	.1
Others	——	——	97	.7	97	.4
Total Fall varieties	8,808	66.5	9,352	71.1	18,160	68.8
Total Fall except McIntosh	5,627	42.4	4,199	31.9	——	——
Northern Spy	527	4.0	176	1.3	703	2.7
Delicious	1,200	9.0	44	.3	1,244	4.7
Russett	——	——	6	.1	6	——
Winter Banana	75	.6	600	4.6	675	2.6
Wagener	2,262	17.1	2,579	19.6	4,841	18.3
Others	285	2.1	332	2.5	617	2.3
Total Winter varieties	4,349	32.8	3,737	28.4	8,086	30.6

TABLE VI.— *Age of Filler Trees in New Hampshire Commercial Orchards*

	UNDER 5 YEARS	5 TO 9 YEARS	10 TO 14 YEARS	15 TO 19 YEARS	20 TO 29 YEARS	OVER 30 YEARS
Non-bearing	8,061	5,194	——	——	——	——
Bearing	——	6,386	6,194	520	22	36
Per cent of total	30.5	43.8	23.5	2.0	0.1	0.1
Cumulative per cent	30.5	74.3	97.8	99.8	99.9	100.0

26 per cent of all the non-bearing trees in the commercial orchards of the state, which is more than sufficient to replace losses.

Some 33 per cent of the bearing commercial trees of the state are found in 460-odd orchards, which vary from 100 to 300 trees in size. In this group there are no doubt many growers who give indifferent care and who produce poor fruit. If the number of bearing trees in each orchard may be taken as an index of the grower's success in the apple industry and his intention to increase his business, these men are on the average the least successful. However, in the group in which the average size of orchard is 150 trees we note that there are for each orchard 57 non-bearing trees, or more than 33 per cent of the number of bearing trees. In the group which averages 250 trees per orchard there are 60 non-bearing trees per orchard or slightly more than 25 per cent. Considered

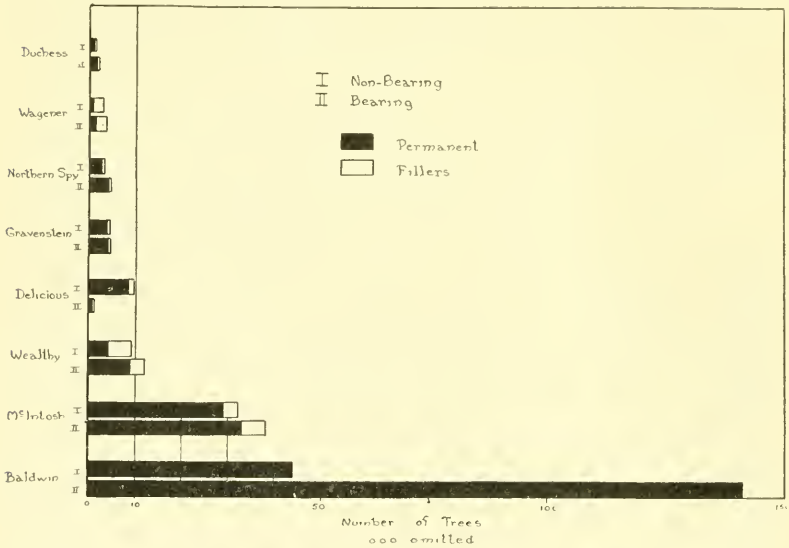

FIGURE 6. Number of trees of important commercial varieties classified as bearing and non-bearing.

from this point of view, the outlook is encouraging. The men who own these orchards would not have as high a proportion of non-bearing trees if on the whole they were not successful and satisfied with the results from their older plantations.

A study of the distribution of the individual orchards within this group has not been attempted. Were such possible, it would undoubtedly give us further interesting information. Today, if we inquire into the history of some of the best fruit farms in New Hampshire we find that 20 years ago they were general farms on which 100 or 200 trees were prov-

ing to be one of the most profitable sources of income. These resident farmers, planting trees in the main in small lots and learning the technicalities of the fruit business as their orchards grew, have become the best fruit growers of New Hampshire. There are undoubtedly today among the group of 462 men owning orchards of between 100 and 300 bearing trees, a considerable number who, like those just mentioned, are to become the successful fruit growers of the future. It is undoubtedly true that a good many of the orchards of this size are not successfully conducted, and probably those orchards are much below average in the number of non-bearing trees. On the other hand, there are probably some of this group who have large plantations of young trees.

TABLE VII.— *Classification of New Hampshire Orchards (801 Orchards) Based on Number of Trees of Bearing Age*

BEARING AGE	NUMBER OF ORCHARDS		TREES NON-BEARING AGE		TREES BEARING AGE		AVERAGE NUMBER NON-BEARING TREES
	Number	Per Cent	Number	Per Cent	Number	Per Cent	
0.....	36	4.5	23,609	19.8	0	——	656
1–99.....	94	11.7	21,283	17.9	5,313	2.3	626
100–199.....	320	40.0	18,353	15.4	42,861	18.4	57
200–299.....	142	17.8	8,629	7.3	34,173	14.7	61
300–399.....	74	9.2	8,393	7.1	25,160	10.8	113
400–499.....	42	5.2	7,692	6.5	18,658	8.0	183
500–749.....	45	5.6	5,966	5.0	26,835	11.5	133
750–999.....	20	2.5	6,784	5.7	16,801	7.2	339
1,000–1,499...	14	1.8	6,735	5.7	15,825	6.8	481
1,500–1,999...	5	.6	3,905	3.3	8,493	3.7	781
2,000–2,999...	5	.6	2,315	1.9	13,332	5.7	463
3,000 or over .	4	.5	5,320	4.5	25,124	10.8	1,330
Total	801	——	118,984	——	232,575	——	290

In many cases these men are pleased with the results which they are obtaining from their orchards and are increasing their plantings at what might seem to them a rapid rate. They have no adequate conception of what their labor income ought to be or of how large a unit they could operate successfully. Their point of view is one based on small beginnings and the lack of familiarity with real commercial units. To bring these men to a realization of what they ought to be accomplishing is a real problem in agricultural extension work.

Records were taken from about 130 farms on which there were less than 100 bearing trees but where there were a considerable number of non-bearing trees. There are, of course, many thousands of other orchards having less than 100 trees but on which there are no new plant-

ings. About 15,000 New Hampshire farms reported some fruit trees in the United States census of 1920. Many of these have undoubtedly perished in the meantime; but the others, it will be remembered, still contain a little over 50 per cent of the total bearing trees of the state.

The group of 100 or more men who have less than 100 bearing trees are of particular interest because each has on the average more than 600 non-bearing trees in his orchard. They own nearly 40 per cent of all the non-bearing commercial trees. Whether or not these men have had experience with trees which will make them successful is difficult to know. The size of their plantations indicates that they are in earnest in the matter of becoming fruit growers; and unless hampered by inexperience, lack of capital or insufficient determination to carry their venture through, they will be a large factor in the future commercial fruit industry of the state.

The owners of large fruit farms still have a considerable number of non-bearing trees. It is hardly to be expected, however, that farms with 2,000 or more trees will make sufficient plantings to more than maintain their present acreage. The group of large fruit farms will increase rapidly; for many if not all of the men with large non-bearing plantations will soon be included in the list of those having more than 500 bearing trees.

GRADING AND MARKETING

Some very interesting information in regard to practices used in harvesting, grading and marketing New Hampshire fruit was obtained in this survey. Table 8 shows the proportion of the crop sold in each of the usual grades based upon a sufficiently large number of barrels to make the classification reasonably accurate. Apple grades in New Hampshire are specified by law as *Fancy, A,* or *B grade.* In addition, it is possible for the grower to sell fruit marked *"unclassified".* It is common when this is done to take the apples as they come from the trees, throwing out those under 2¼ inches in diameter or culls badly-diseased or insect-stung. The tree-run grade, which would be marked the same, technically should include all apples taken from the trees. As a matter of fact, however, growers and buyers frequently speak of the unclassified apples from which the culls have been removed as tree-run. Apples which are not good enough to be included in the B grade are sometimes marketed as "unclassified". In this survey these apples are called *"ungraded with the 1's and 2's out."* Only a small proportion of New Hampshire apples are sold by this method, most of the apples not good enough for B grade being sold as culls for manufacture into cider or other by-products.

A good deal of confusion as to the meaning of the terms of the grading law and as to just what apples should be included in each grade exists among the smaller growers and indeed among many of the better growers of the state. It was evident in examining the records that many apples had been reported as being sold as A grade when, as a

matter of fact, they should more correctly be classified as "ungraded, culls out". Each schedule was therefore carefully examined and the grading of the apples studied in relation to the orchard practice, particularly the spraying. In some cases where the evidence appeared clear, apples reported as A grade were changed to the ungraded class, and in other cases where the information did not appear to be consistent the records were discarded. Records of grade and price which appear reasonably dependable were thus obtained for about 134,000 barrels of Baldwins, approximately 17,000 barrels of McIntosh, 4,000 to 5,000 each of Wealthy and Gravenstein and about 1,600 of Northern Spy.

The most striking fact which these data show is that a very large proportion of the crop is sold unclassified in mixed grades. In order to bring out this comparison more clearly a classification of the sales on the basis of whether or not they have been graded is given in Table 9. More than half of all the apples in the state apparently are sold on an unclassified basis, the proportion being somewhat smaller with Wealthy and McIntosh and highest with Northern Spy. In the principal variety, Baldwin, we note that of those sold in barrels, which is approximately two-thirds of the crop, about 54 per cent are sold ungraded, and of those sold in boxes about 65 per cent. The fact that the proportion of ungraded apples is higher in the box than the barrel packs may be due in part to the practice of selling to peddlers, buyers for chain stores who take "everything down to 2¼ inches", or other country buyers who prefer the apples in boxes. Selling to buyers who furnish their own boxes is prevalent in southern New Hampshire.

Many growers raise the question as to whether or not it pays to sort the apples into two or three grades besides the culls, and even some men who give their orchards excellent care claim that it does not pay them to do so. In Table 9 on page 32 there is given the price per barrel for graded and ungraded stock of each variety both when packed in barrels and when packed in boxes. The price given is the weighted average net price for all grades, Fancy A and B sold separately, as compared to the receipts for ungraded in which the three grades are sold in the same barrel or box. In order to have more ready comparison, the price of the box-packed fruit is also expressed on the barrel basis, three boxes being considered equivalent to one barrel. It is clear that without exception the graded fruit brings more money. In the case of Baldwins there is a margin of 62¢ on the barrel-packed fruit and of slightly over $2.00 on the box-packed. In McIntosh it is approximately $1.80 on the barrel stock and $2.15 on the boxes. The smallest difference appears in the case of the Wealthy, in which the ungraded stock sells for only 28¢ per barrel less than the graded; but there is a difference of about $1.50 on the box basis.

The margin in many instances is not large, and there has been a possible increased cost of 15¢ for the grading. Nevertheless, a small increase in price may form a relatively large proportion of the *net*

Table VIII.— *Proportion of Each of Several Important Varieties of Apples Packed in Different Grades*

	Fancy		A Grade		B Grade		Ungraded 1 and 2 Out		Ungraded Culls Out		Tree Run		Culls		Grand Total
	No. Bbls.	Per Cent	No. Bbls.	Per Cent	No. Bbls.	Per Cent	No. Bbls.	Per Cent	No. Bbls.	Per Cent	No. Bbls.	Per Cent	No. Bbls.	Per Cent	
Baldwin															
Barrels	856	0.9	23,480	25.7	9,846	10.8	545	0.6	38,618	42.3	10,296	11.3	7,598	8.4	91,239
Boxes	915	2.1	6,300	14.7	3,362	7.9	180	0.4	24,234	56.6	3,580	8.4	4,215	9.9	42,786
Total	1,771	1.3	29,780	22.2	13,208	9.9	725	0.6	62,852	46.9	13,876	10.4	11,813	8.8	134,025
Northern Spy															
Barrels	20	1.9	240	22.3	25	2.3	2	0.2	648	60.3	60	5.6	80	7.4	1,075
Boxes	3	0.5	76	12.5	85	14.1	——	——	395	64.7	27	4.4	23	3.8	609
Total	23	1.4	316	18.8	110	6.5	2	0.1	1,043	62.0	87	5.1	103	6.1	1,684
McIntosh															
Barrels	20	0.5	1,481	39.2	365	9.7	10	0.3	1,168	30.8	689	18.2	49	1.3	3,782
Boxes	179	1.4	4,746	36.5	1,414	10.9	202	1.6	5,274	40.5	916	7.0	276	2.1	13,007
Total	199	1.2	6,227	37.1	1,779	10.6	212	1.3	6,442	38.4	1,605	9.5	325	1.9	16,789
Wealthy															
Barrels	——	——	502	33.2	278	18.4	——	——	515	34.1	185	12.3	30	2.0	1,510
Boxes	25	0.8	1,171	38.8	348	11.5	20	0.7	1,211	40.2	134	4.4	108	3.6	3,017
Total	25	0.6	1,673	37.0	626	13.8	20	0.5	1,726	38.1	319	7.0	138	3.1	4,527
Gravenstein															
Barrels	2	0.2	222	17.8	34	2.7	——	——	759	60.9	218	17.5	11	0.9	1,246
Boxes	25	0.8	1,286	40.6	306	9.5	68	2.1	1,352	42.1	90	2.8	86	2.7	3,213
Total	27	0.6	1,508	33.8	340	7.6	68	1.5	2,111	47.4	308	6.9	97	2.2	4,459

profit. While we have no extensive data upon which to base estimates it is probable that, under average New Hampshire conditions, it costs from $2.50 to $3.00 to grow, pack, and deliver a barrel of apples to the shipping point. If for Baldwin apples packed in barrels, we were to assume a cost of production of $3.00, *the net profit on the graded fruit would be nearly three times that on the ungraded.* However, this by no means settles the case as to the desirability of grading, because the fruit which was graded in all probability was also more thoroughly sprayed and in general was given better care. It is certain that *if the fruit is of poor quality, it cannot be improved by grading and is better sold without incurring the labor cost of grading.* If it were possible to lay down a general rule it would probably be on the basis that it does not pay to grade fruit which contains more than a certain proportion of B grade apples, for instance 40 per cent.

In Table 9 on page 32 there is an opportunity to compare the price received for the same quality and grade of fruit sold in boxes and in barrels. There

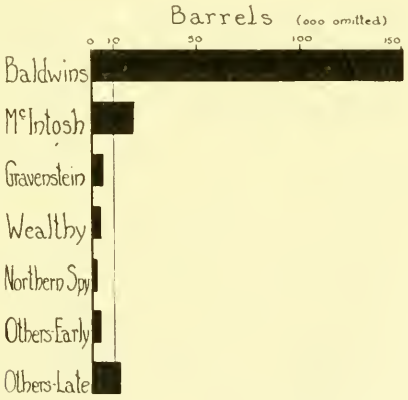

FIGURE 7. Relative production of important commercial varieties in New Hampshire, 1924.

appears to be a large margin in favor of marketing in boxes. Thus, in graded Baldwins the price received in boxes is nearly $1.50 more than that received for barrelled stock. In McIntosh it is about $1.29. In ungraded Baldwins, however, this margin practically disappears. The average price for ungraded Baldwins in boxes is based upon 126 different sales covering about 28,000 barrels. The barrel sales are based upon slightly over 300 sales covering nearly 50,000 barrels. This should give a fairly accurate average in each case. No reason is known why this variety and grade should be different from the others. It is known that a considerable number of farm apples stored in bins and cellars until late autumn, and therefore not of very high quality, were sold to

buyers who brought their own boxes. This may have had an influence on the price. There were also a number of large sales of apples packed in boxes made early in the season of 1924 to chain stores, at a price rather under that which prevailed a little later in the season.

While the data would appear to indicate that more was received for the apples in boxes, the conclusion that the box is a better package should not be reached without due caution. Aside from the instances mentioned, it is only the relatively up-to-date fruit growers who are using the box to any great extent. About 100 per cent of those small scale fruit growers who care for their trees indifferently use the barrel. It is likely that the apples marketed in barrels were not as good on the average as those packed in boxes. Also in many cases the boxed apples were layer-packed involving extra expense for which there has to be a greater return. While the box meets with great favor in the locality of Boston, apples sold in other centers or disfributed from Boston to outside cities, frequently are sold more readily in barrels than in boxes.

The prices of each grade of apples per barrel and per unit box are shown in detail in Table 10. As may be noted by referring to Table 8, only a very small proportion of the crop is sold under the Fancy grade. The number of sales upon which the Fancy grade prices are based is so small that the figures can by no means be assumed to be accurate. It is by far more usual to combine the A grade and the Fancy in one pack, and prices recorded for A grade mean for all practical purposes a mixture of these two in different proportions according to the individual pack. The average prices for the different classifications of Northern Spy apples are also based upon very small numbers. The price of $4.16 per barrel for B grade Spies is based upon only five sales and cannot be considered representative of what this grade would ordinarily bring. Perhaps the most striking lesson to be gained from this table is the difference in price between A grade and the lower grades of fruit, either B grade fruit, or ungraded. The difference for this crop is certainly no larger than would ordinarily be the case; for many growers who received low prices for B grades in the 1923 crop packed A grade down to 2¼ inch and turned the B grade into cider. This practice would reduce somewhat the price of A grade fruits. It is also safe to assume that only the best B grade apples were sent to market in 1924.

If again one will take into account the matter of costs of production, it appears that for the most part there is little or no profit in the B grade fruit particularly with Baldwins, although the margin in A grade stock is sufficient to make a good labor income for the man who is operating an orchard of sufficient size. It should be explained that the estimated cost of production which has been mentioned covers not only overhead and supplies but also labor. Therefore, the farmer who is producing 2,000 barrels of apples has a very fair income in addition to his day wages provided that a large proportion of the fruit grades A or better.

In Table 11 there is given a summary of the methods of the sale of New Hampshire apples, the same information being shown graphically in Fig. 8. The New Hampshire farmer has a strong tendency to sell his apples for cash in the autumn. Thus, the country buyer and the city wholesaler receive well over half of the crop. Commission sales either for domestic or foreign markets cover nearly another 14 per cent of the total.

There are as yet only a small proportion of New Hampshire apples marketed through cooperative associations. The selling of apples, provided that they are of good quality, is so easy in this territory that there is small wonder that the fruit growers have neglected to organize. There is a possibility, as we shall see later, that this situation may

TABLE X.— *Prices of Leading Varieties of Apples in New Hampshire by Grades*

	FANCY	A GRADE	B GRADE	UNGRADED 1 AND 2 OUT	UNGRADED CULLS OUT	TREE RUN
Baldwin						
Per Barrel	$6.02	$4.17	$2.99	$2.01	$3.36	$2.85
Per Box	2.15	2.05	1.18	.56	1.12	1.03
Northern Spy						
Per Barrel	9.00	4.37	4.16	1.75	3.81	3.16
Per Box	2.00	2.59	2.11	—	1.16	.89
McIntosh						
Per Barrel	15.00	6.47	4.58	4.00	5.29	2.94
Per Box	2.77	2.65	1.92	1.20	1.81	1.57
Wealthy						
Per Barrel	—	4.41	3.62	—	4.05	3.37
Per Box	2.00	2.06	1.14	.90	1.39	.87
Gravenstein						
Per Barrel	5.75	4.90	3.28	—	3.38	2.80
Per Box	2.50	1.68	1.42	.79	1.28	1.31

be changed within the next decade. The discussion of this, however, we will leave until the conclusion when a forecast is made of the development of the industry for the next 15 years.

In Table 12 on page 32 there is given a summary of the methods by which New Hampshire apples are moved to market. It is of interest simply in that it indicates that nearly half of the apples reach the consumer by transportation over the highways, rather than by rail or boat.

CULTURAL METHODS

No district can expect to compete in the apple market of today unless scientific methods of orcharding are adopted. Information on orchard practices is of interest particularly so far as it enables us to determine to what extent approved practices are being used in New Hampshire orchards. The data do not lend themselves to tabulation, and will, therefore, largely be presented in the text.*

*For further information, see New Hampshire Extension Circular 62, "Production Practices in New Hampshire Orchards"

Nine-hundred-twenty-seven reports were made on the system of orchard culture used. This means, of course, that a number of men are using more than one system of orchard soil management. Sod and mulch orchards formed by far the larger proportion, the two making a little over 76 per cent of the total. Cultivation, in most cases including production of some kind of intercrop, is probably practiced in 43 commercial orchards, or nearly 5 per cent of the total, while 173 orchardists, or a little less than 19 per cent, use cultivation with some form of cover crop which is plowed under.

Two-hundred and ninety-six orchardists, or about 32 per cent of the total, indicate that their sod orchards are mulched, meaning that they leave at least the grass which grows in the orchard. Some of the better growers are known to supply additional mulch if it can be obtained without excessive cost from adjoining meadows. The replies would indicate that the hay is removed from a large number of orchards. There is reason to believe that the removal of hay is practiced mostly in small orchards, and the proportion of the crop affected is not as large as the number of growers might lead one to think. It is a poor practice, although it is not as bad if sufficient organic matter is returned as stable manure. It is probable also that the growers in replying to the questions did not distinguish clearly between sod and sod mulch culture.

In some sections it is only the negligent fruit growers who maintain the orchards in sod. In New Hampshire it has been demonstrated that sod culture with the use of appropriate fertilizers is a perfectly satisfactory method of orchard soil management. The use of this method has made it possible to develop orchards on very cheap, rocky pasture lands which cannot be plowed and which otherwise could produce little or nothing of value. In this instance, therefore, sod culture is not an indication of poor orchard management.

Of those who cultivate crops between their trees, and this presumably applies wholly to young orchards, 32 report that they use corn, 18

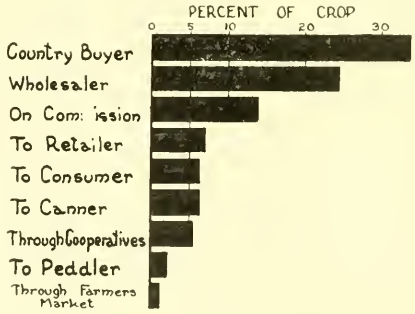

FIGURE 8. Methods of sale in New Hampshire commercial orchards, 1924.

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TABLE XI.— *Methods of Sale for New Hampshire Apples, 1924*

METHOD OF SALE	SUMMER		FALL		WINTER		TOTAL		PER CENT OF TOTAL
	Number Reports	Number Barrels	Number Reports	Number Barrels	Number Reports	Number Barrels	Number Reports	Number Barrels	
Direct to Consumer	50	437	89	2,091	101	7,101	240	9,632	5.5
Through roadside market	7	58	12	300	12	691	31	1,049	.6
Farmers' market	2	44	4	542	6	1,288	12	1,874	1.1
To peddler	4	31	17	532	28	3,270	49	3,833	2.2
To retailer	27	430	61	3,362	71	8,126	159	11,918	6.9
City wholesaler	13	278	48	2,994	128	39,200	189	42,472	24.5
Country buyer	18	227	102	6,905	250	51,098	370	58,230	33.6
On commission	7	114	51	1,249	71	16,035	129	20,398	11.8
For export, on commission	1	12	7	2,120	7	1,583	15	3,715	2.1
Through co-operatives	—	—	10	1,569	25	7,645	35	9,214	5.3
For canning or manufacture	—	—	5	232	26	2,293	31	2,525	1.5
Cider	1	8	21	519	156	7,109	178	7,936	4.6
Used on farm	1	10	1	13	1	160	3	183	.1
Vinegar	—	—	1	58	1	12	2	70	.0
Sold on trees	—	—	—	—	1	350	1	350	.2
Grand Total	—	—	—	—	—	—	1,444	173,399	100.0

TABLE IX.— *Sales of Apples Classified as Graded, Ungraded and Culls*

VARIETY	NUMBER OF SALES	GRADED			UNGRADED			CULLS		
		Number of Barrels	Per Cent of Total	Price per Barrel	Number Barrels	Per Cent of Total	Price per Barrel	Number Barrels	Per Cent of Total	Price per Barrel
Baldwin										
Barrels	730	34,182	37.4	$3.87	48,914	53.6	$3.25	8,143	9.0	$0.68
Boxes	309	10,577	24.7	5.35	27,814	65.1	3.33	4,395	10.2	.70
McIntosh										
Barrels	118	1,866	49.3	6.19	1,857	49.1	4.42	59	1.6	1.08
Boxes	240	6,339	48.8	7.48	6,190	47.5	5.33	478	3.7	1.88
Wealthy										
Barrels	36	780	51.6	4.15	700	46.4	3.87	30	2.0	.59
Boxes	109	1,544	51.1	5.57	1,345	44.6	4.01	128	4.3	.89
Northern Spy										
Barrels	83	285	26.5	4.67	708	65.9	3.75	82	7.6	.58
Boxes	42	164	27.1	7.00	422	71.1	3.15	23	3.8	1.19
Gravenstein										
Barrels	58	258	20.7	4.69	977	78.4	3.25	11	0.9	.60
Boxes	139	1,617	50.3	4.93	1,442	44.9	3.86	154	4.8	1.36

TABLE XII.— *Method of Moving New Hampshire Apples to Market*

	SUMMER		FALL		WINTER		TOTAL		PER CENT OF TOTAL
	Number Reports	Number Barrels	Number Reports	Number Barrels	Number Reports	Number Barrels	Number Reports	Number Barrels	
How Moved:									
By Wagon — Barrels	3	72	11	328	31	2,891	45	3,291	2.3
By Truck — "	60	865	173	11,138	263	47,554	496	59,557	42.2
By Rail — "	11	106	93	7,916	278	67,281	382	75,303	53.4
By Boat — "	—	—	4	1,164	9	1,818	13	2,982	2.1
Grand Total	—	—	—	—	—	—	936	141,133	100.0

potatoes, 22 beans, and 18 garden crops. Cabbage is used by 5 growers. In the southern part of the state there are some thrifty farmers who vouch for the fact that they have been able to entirely pay for their investment in bringing the orchards into bearing by the production of garden crops between the rows. Only those experienced in market gardening could hope to do this. All crops should be kept sufficiently far from the trees not to harm the orchard.

Of the 111 men who grow a cover crop to be plowed under, the largest proportion, namely, 30 growers, or about 27 per cent, use buckwheat. Twenty growers merely cultivate until mid-summer and then allow weeds to form the cover crop. Rye, millet, oats, clover, vetch, and rape are among the other materials used. The weed cover crop is not as reliable as a seeded crop, but the evidence from a considerable number of experiments indicates that the rather serious bad effects which follow constant cultivation of an orchard until late autumn are seldom experienced if the cultivation is ceased during mid-summer and weeds allowed to develop.

Of the growers interviewed, 797 furnished information as to their practice in fertilizing the orchard. Of these 58, or 7.3 per cent, do not use fertilizer. Four hundred and seventy-three, or nearly 60 per cent, fertilize regularly every year while 11 men make a practice of fertilizing every second year. The remaining 255 men, or about 32 per cent, fertilize at irregular intervals. The need of fertilization varies according to the system of orchard culture. Trees in cultivated orchards, especially if young, often fail to respond to the application of fertilizer for a considerable period of years enough to justify the expense of the application. If trees are planted in sod, annual fertilization is absolutely essential for the production of best yields. Since we have seen that more than 76 per cent of the orchards are in some form of sod culture and since only 60 per cent of the growers practice annual fertilization, there is evident need for improvement in this practice. High yields and adequate returns cannot be expected unless the trees are fertilized enough to make vigorous growth.

In Table 13 information is presented on the number of growers using each of various kinds of fertilizers. The percentage of the total number of growers using each material is indicated, but because each may use two or more kinds, these percentages total to much more than 100. It may be noted that the group who fertilize annually use in the main nitrate of soda and stable manure. From other observations it may also be stated that the group of men using nitrate of soda probably is most largely made up of those who have large commercial units. Only those with small orchards and large dairy herds can hope to have an adequate supply of stable manure . When the fertilizer has to be purchased, it is most economically obtained in the form of nitrate of soda or sulphate of ammonia.

There is a considerable difference in opinion as to the necessity of using fertilizer elements other than nitrogen. The evidence from ex-

periments has not yet been demonstrated that there is an appreciable benefit from such a practice. Many of the best growers, however, use acid phosphate or mixed chemicals in addition to the nitrogenous material as a matter of insurance. There can be no objection to such a practice provided that in order to do so they do not reduce their applications of nitrogen to too low a point. Sod orchards such as constitute the majority of New Hampshire plantings are rarely successful without large supplies of nitrogen.

Sixty-five per cent of the growers report that they prune every year, and nearly 30 per cent more prune occasionally. Slightly less than 2 per cent never prune. Approximately 3 per cent of the men indicate that their trees are pruned every 2 or 3 years. It is essential, particularly if the trees are adequately fertilized, that they be pruned to a sufficient extent to keep them open to light and accessible for the sprayer. The proportion of men who prune their trees is fairly satisfactory; but it is probable that in particular those who prune occasionally, or every two or three years, could greatly improve their practice in this respect.

Information as to the spraying or dusting practice was obtained for all but one of the 804 farms visited. Seventy-seven of these men do not spray or dust. Probably they are the same ones who do not fertilize or prune regularly. They constitute nearly 10 per cent of the growers. The majority, 712 men, or nearly 89 per cent, prefer liquid applications, while 14, or somewhat less than 2 per cent, use dust. The number of applications used is shown in Table 14. Referring to those who use the liquid materials, it is encouraging to note that approximately 35 per cent use the pre-pink, 45 per cent use the pink, and 95 per cent use the calyx application. In some of the larger orchards dusting equipment is maintained in addition to the sprayers but is reserved for use in case that bad weather or other circumstances renders it impossible to complete the liquid application. Others spray the early applications which are of greatest importance for control of scab and use dust later in the season.

That the practice of spraying is gaining is indicated by the fact that more growers use two sprays than one, and the proportion of those who use three or four is fairly high. Under New Hampshire conditions it is often possible to produce excellent crops of scab resistant varieties such as the Baldwin, using only one or two sprays each season. However, if the state is to attain a reputation for apples of uniformly high quality one year with another, the adoption of at least three sprays is necessary in most districts.

The practice of thinning is one in which all progressive New Hampshire fruit growers are interested although as yet only about 17 per cent have tried it. Only 1.6 per cent make a regular practice of thinning all varieties, and about 15 per cent more thin certain varieties. Of the 134 growers who report that they thin more or less, about 15 per cent use the practice on McIntosh, about 34 per cent thin Wealthies, and

TABLE XIII.— *Materials for Fertilization*

USED BY		KIND OF MATERIAL										
		Manure	Nitrate Soda	Acid Phosphate	Compost	Commercial Fertilizer	Wool Waste	Sulfate of Ammonia	Lime	Muriate Potash	Ashes	Tankage
739 Growers who Fertilize	Number of men..	488	377	29	—	35	—	16	—	—	—	—
	Per Cent of Group	66.0	51.0	3.9	—	4.7	—	2.2	—	—	—	—
473 Growers who Fertilize Annually	Number of Men..	288	301	18	1	25	1	14	1	1	7	—
	Per Cent of Group	60.9	63.6	3.8	0.2	5.3	0.2	3.0	0.2	0.2	1.5	—
11 Growers who Fertilize Biennially	Number of Men..	11	5	—	—	—	—	1	—	—	1	2
	Per Cent of Group	100.0	45.5	—	—	—	—	9.0	—	—	9.0	18.2
255 Growers who Fertilize Occasionally	Number of Men..	189	71	11	—	10	—	1	—	—	3	—
	Per Cent of Group	74.1	27.8	4.3	—	3.9	—	0.4	—	—	1.2	—

TABLE XIV.— *Applications Used*

USED BY		NUMBER USING				TOTAL NUMBER OF APPLICATIONS USED*							
		Dormant	Pre-pink	Pink	Calyx	1	2	3	4	5	6	7	8
712 Growers who Spray	Number of Men	443	270	324	687	159	179	130	108	47	32	19	0
	Per Cent of Group	62.2	37.9	45.5	96.5	22.3	25.1	18.3	15.2	6.6	4.5	2.7	—
14 Growers who Dust	Number of Men	3	9	8	14	2	5	4	4	1	—	1	1
	Per cent of group	21.4	64.3	57.1	100	14.3	35.7	28.6	28.6	7.1	—	7.1	7.1

*Discrepancies between totals in this table and number of growers are due to fact that a few growers did not supply information on this point, and a few use both spray and dust at different times.

approximately 32 per cent thin their Baldwins. Duchess, Gravenstein, Delicious, Ben Davis, Wagener, Wolf River, Greening and Jonathan are reported among other varieties thinned. About 65 per cent of the men do this work during the month of July, 20 per cent in June and 12 per cent in August. The making of hay is an important task even on most of the specialized fruit farms. One of the chief hindrances to the adoption of thinning is the fact that it is best done at approximately the same time that the hay should be made. In many cases the hay would be better if it were put up earlier. The adoption of thinning cannot be urged too strongly.

Low quality fruit depresses the market and hinders the sale of good stock to an even greater extent than additional supplies of good apples. Thinning reduces slightly the total crop on the tree; but because it eliminates the low grade apples and allows only those which are sound and of good shape to grow larger, it invariably increases the net profits of apple production. If every fruit grower in the United States could be induced to thin, the total supply of apples would be slightly reduced and the quality materially increased. Both factors would tend to raise the price of the fruit.

Information was also requested as to source, character and availability of labor supply. This is of importance in relation to further development of the industry. About 30 per cent of the fruit growers operate their orchards with their own labor and that of other members of the family. The large majority, however, must employ help. One of the difficulties with the orchard business is that it is largely seasonal with the peak labor demand at the harvest season. In New Hampshire orchards practically all of the fruit growers hire outside help in their own locality. In a few instances students and laborers from the cities and shops are employed. Thirty per cent of the growers find no difficulty in obtaining the necessary labor. Twenty-three per cent indicate that it is obtained fairly easily, while about 46 per cent experience more or less difficulty. The character of the labor employed is classed as skilled by about one-half of the growers, and as unskilled by the remainder.

FORECAST OF PRODUCTION

In conclusion, as accurate an estimate as possible has been made of the probable development of New Hampshire orchards for the next 15 years. It must be emphasized that these are only estimates and that the factors which control the growth of the industry may change markedly one way or another before the period covered has elapsed. Even so, these forecasts may be of value in determining the policy to be followed by New Hampshire orchardists.

In order that the reader may more accurately judge the nature of these estimates it should be stated that it has been assumed that planting will continue for the next 15 years at the same rate as between the years 1920-1926. It has also been assumed that many of these

young plantings will be lost owing to neglect, inroads by game, unfavorable weather conditions, or because of lack of judicious selection of the land upon which they are to be planted or the varieties used. It has been assumed that 15 per cent of any group of trees listed as under 5 years of age will be lost by the time that these trees are 10; that 10 per cent of any group between 5 and 10 will be lost before they are 5 years older; and similarly 5 per cent of the 15-year-old group, and two per cent of the 20-year-old trees. It has also been assumed that two-thirds of all the trees now planted as fillers will be removed by 1940.

The greatest question in making an estimate of this sort is as to those trees recorded in the survey as over 30 years of age. This is of major importance in our state chiefly because there are 76,000 Baldwin trees more than 30 years of age. How long these trees will last depends mainly upon the present age of the trees and the care which they are going to receive. The care which they receive may in turn depend largely upon the condition of the apple market during the next 10 or 15 years. There is a possibility for wide differences of opinion as to the rate at which these trees will die off.

Present indications are that New Hampshire growers are fairly well satisfied with present returns on their Baldwin apples, and it seems doubtful if at present any other crop can be grown to as good an advantage. It appears to the writers that there is no reason to believe these trees will suffer from more neglect in the immediate future than has been their lot in the past. It has, therefore, been assumed that 20 per cent of these trees will die off during each of the next 5-year periods, in other words that they will be half gone by 1940, and that the last stragglers will disappear about 15 years later. Since we have many thrifty orchards 50 years of age and it is possible to point out at least several in which the trees are nearly 100 years of age, this basis of estimate appears to be fairly well substantiated.

After determining the approximate number of trees of each age for the three periods, production has been estimated on the basis of present yields allowing for increased bearing surface as the trees grow older. The data are presented in a Table on page 2. If the estimates have not been made on too optimistic a basis, it is evident that fruit production in these important varieties will increase materially in the next 15 years. The greatest increase on the percentage basis is in the Delicious variety in which we may anticipate crops 20 to 22 times as large as those now harvested. However, the total volume will not be large, because at present the crops are exceedingly small. In the volume of production the greatest increase is to be expected in the Baldwin varieties. In 1940 a crop of apparently 80,000 barrels larger than that harvested in 1924 may be expected. Crops of Wealthy apparently will increase up to practically two-thirds the size of our present crops of McIntosh. There would appear to be greater question as to the feasibility of marketing this supply of apples than of any other variety in the list. Some Wealthies may be top-grafted within the next decade

or two. Crops of McIntosh may be expected to triple, reaching proportions somewhat under half of the present Baldwin crop. The outlook in the markets for this variety is such that no difficulty need be anticipated in finding markets for these apples provided that they are properly grown and packed. If this variety is planted to a greater extent in the future than in the past, production may be even greater than estimated.

In conclusion, two or three facts need to be emphasized. In the first place it is not likely that New England markets can absorb all of the fruit which is to be produced in this section. Arrangements will have to be made for marketing a considerable proportion of the crop elsewhere. This means that fruit growers must begin to consider seriously the matter of cooperation and organization in order to establish brands of New England apples in sufficient volume so that they may be known in the large apple markets outside New England. In the second place, too great emphasis cannot be placed upon care and skill in grading and packing. Mixed fruit may sell satisfactorily to the peddler who in return retails it to the consumer; but when fruit is to be bought and sold in the large markets, the trade calls for standard goods in which all the apples in each package are of the same size and grade. In the third place, the situation calls for the adoption of the best methods in orchard practice. Poorly sprayed fruit and apples of small size because of inadequate fertilization must be eliminated from the state's production if we are to attain the reputation for good apples which will be necessary when we ship to outside markets.

A thorough study of the facts collected for this publication shows a considerable increase in the commercial apple industry of New Hampshire. It is encouraging to note the marked development of commercial orchards during the last fifteen years. The survey shows that in 1925 there were 351,959 trees listed in commercial orchards, and of that number 202,472 trees were planted between 1910 and 1925. Table 15 has been carefully worked out and shows a probable steady increase in the commercial apple production; with 1925 as a standard, it seems likely that by 1930 there will be a 27 per cent increase, in 1935 a 51 per cent increase, and in 1940 a 75 per cent increase.

With the growth of the apple industry in New Hampshire a good many acres of unproductive farm land are again becoming productive. Orcharding is one of the few types of agriculture that is on the increase in New England; and the opportunity of raising high quality fruit in competition with other areas seems to justify a normal expansion.